



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,537	08/29/2001	Jong Chen	67,200-477	4317

7590 09/11/2003  
TUNG & ASSOCIATES  
838 W.Long Lake Road, Suite 120  
Bloomfield Hills, MI 48302

EXAMINER

RUGGLES, JOHN S

ART UNIT	PAPER NUMBER
----------	--------------

1756

DATE MAILED: 09/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/941,537	<b>Applicant(s)</b> CHEN ET AL.	
	<b>Examiner</b> John Ruggles	<b>Art Unit</b> 1756	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 August 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,7,8,10,11,13-15 and 17-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,7,8,10,11,13-15 and 17-24 is/are rejected.
- 7) ☒ Claim(s) 11,13-15,17-19,22 and 24-26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Drawings*

Replacement sheets of corrected drawings showing amended Figures 1 and 3 were received on 01 August 2003 and filed as Paper No. 3 in response to the previous objections of Paper No. 2.

However, the drawings are still objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "10" in amended Figure 1 remains as designating both an inter-metal dielectric (IMD) layer 10 and a photoresist layer 16 as described in paragraph (¶) 009 on page 5. This objection remains even though applicant has stated the intention on page 2 of this amendment to renumber the resist layer as 16 in amended Figure 1. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are also still objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: amended Figure 1 does not show photoresist 16 as described in ¶ 009 on page 5 (additional references to photoresist 16 are also found in at least ¶ 0012 and ¶ 0013 on page 7). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. These objections to the drawings will not be held in abeyance.

Art Unit: 1756

*Specification*

The change in title for this invention to "Method for Reducing Light Reflectance in a Photolithographic Dual Damascene Trench Patterning Process", which was requested by applicant in Paper No. 3 is hereby acknowledged.

However, applicant is reminded again of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure (¶ 0045 on page 25) is still objected to because: (1) "said" should still be replaced with --the--, as previously requested in accordance with the guidelines noted above; and (2) "in photolithographic" should be --in a photolithographic--. Correction is required. See MPEP § 608.01(b).

In addition, the newly filed amended abstract of the disclosure does not commence on a separate sheet in accordance with 37 CFR 1.52(b)(4). A new abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text.

The disclosure is still objected to because of the following informalities previously stated, but not addressed by the amendment filed as Paper No. 3: (1) in ¶ 007 on page 4, "interconnect

Art Unit: 1756

lines. the via opening” must be corrected to --interconnect lines. The via openings--; (2) in ¶ 008 on page 4, “lines, compromises” should be changed to --lines and compromises--; (3) in ¶ 0010 on page 6, “the formation via openings” should be corrected to --the formation of via openings--, to be grammatically correct; and (4) in ¶ 0015 on page 9, “be apply” should be corrected to --be to apply--, to be grammatically correct.

Additionally, amended ¶ 0042 presented on page 7 of Paper No. 3 introduces new matter by changing the photoresist thickness of “1000 to 20000 Angstroms” found in the prior version of ¶ 0042 on page 18 of the original specification to “5000 to 9000 Angstroms”, which is not supported by the original specification. The fact that this change has not been marked as altered in the newly amended version as filed suggests that the change was merely unintentional. Even so, applicant must still clarify the written record in this application by acknowledging this oversight and amending this range for photoresist thickness in ¶ 0042 back to the range as originally filed to remove this new matter in response to this objection.

Appropriate correction is required.

### ***Claim Objections***

The previous objection to originally filed claim 20 has been overcome by the currently amended version of this claim filed in Paper No. 3.

However, current amendments to the claims have necessitated a different objection to claims 11, 13-15, 17-19, 22, and 24-26, which are now objected to because of the following informalities: in the last two lines of currently amended claim 11, “one or more of the via

opening" should be corrected to --one or more of the via openings--, to be grammatically correct. Currently amended claims 13-15 and 17, original claims 18-19, and new claims 22, 24, and 26 are all dependent on currently amended claim 11.

Also, new claims 25-26 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to clearly further limit the subject matter of previous currently amended claims 1 and 11, respectively, on which these new claims depend. This is because currently amended independent claims 1 and 11 already recite a dual damascene process for forming a structure and are, therefore, not further limited by repeating this same language in the new dependent claims 25-26. Accordingly, these claims have not been further treated on the merits. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

#### ***Claim Rejections - 35 USC § 112***

The previously stated rejection to claims 1-10 and 16 under 35 U.S.C. 112, second paragraph has been overcome by the currently amended version of claim 1 from which original claims 2-10 depended and also because original claims 4-6, 9, and 16 have now been cancelled.

However, the currently amended version of claim 11 has necessitated another rejection under 35 U.S.C. 112, second paragraph, which is applied below.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 1756

Claims 11, 13-15, 17-19, 22, 24, and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In currently amended claim 11, the phrase "the one via openings" recited in the step of depositing a second ARC layer lacks antecedent basis. For the purpose of this Office action and in order to advance prosecution of this application, this phrase has been interpreted to mean --one or more of the via openings--, as suggested in the subsequent photoresist photolithographic patterning step recited in this same amended claim. However, this claim must still be amended in response to this rejection. Currently amended claims 13-15 and 17, original claims 18-19, and new claims 22, 24, and 26 are all dependent on currently amended claim 11.

Also, in currently amended claim 15, it is unclear whether or not both the first and second ARC layers are selected from the same member of the group consisting of silicon oxynitride and titanium nitride (e.g., whether or not both ARC layers are composed of the same material, etc.). For the purpose of this Office action and in order to advance the prosecution of this application, this claim is interpreted in light of the specification to mean that the first ARC layer should be silicon oxynitride while the second overlying ARC layer is selected from this group to be either silicon oxynitride or titanium nitride, depending on the wavelength of light used for exposure under which the second ARC is expected to function. This is because ¶ 0035-¶ 0037 of the original disclosure only specifically support (1) silicon oxynitride or silicon nitride for the etching stop layer 28 (first ARC layer) while (2) the ARC 26 (second ARC layer) is said to be either silicon oxynitride or titanium nitride; and further, that the choice in each case is dependent on the exposure wavelength used for patterning over each ARC layer (e.g., silicon oxynitride is a

Art Unit: 1756

preferable first and/or second ARC material for a deep ultraviolet (DUV) source, titanium nitride is a preferable second ARC material for an I-line source, etc.).

***Claim Rejections - 35 USC § 102***

The previous rejection of original claims 1-20 under 35 U.S.C. 102(b) as being anticipated by Lin, et al. (US Patent 6,042,999) is now withdrawn in view of currently amended claims 1-3, 7, 10-11, 13-15, 17, and 20, and also because original claims 4-6, 9, 12, and 16 have been cancelled.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 7-8, 10-11, 13-15, and 17-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin in view of Yu, et al. (US Patent 6,027,861), and further in view of Filipiak, et al. (US Patent 5,918,147).

Lin teaches a robust dual damascene photolithographic process with reduced light reflectance. The process starts by providing a semiconductor substrate having substructure devices formed in or on the substrate, including metal layers (column 4, lines 35-54). A lower layer dielectric (LLD) 110 (pointed out as an intermetal dielectric, IMD, when coated on metal),



Art Unit: 1756

a thin conformal etch-stop layer 120, and an upper layer dielectric (ULD) 130 are formed on the substrate (instant claim 2). Both lower and upper dielectric (LLD and ULD) layers may be formed of silicon oxynitride ( $\text{SiON}$ ,  $\text{SiO}_x\text{N}_y$ ), silicon nitride ( $\text{Si}_3\text{N}_4$ ,  $\text{SiN}$ ), or silicon oxide by PECVD, CVD, PVD, or sputtering, preferably to a thickness of 8,000 to 15,000 Angstroms ( $\text{\AA}$ ) (column 5, lines 1-9, instant claims 21-22). The etch-stop layer can be silicon oxynitride ( $\text{SiON}$ ,  $\text{SiO}_x\text{N}_y$ ), silicon nitride ( $\text{Si}_3\text{N}_4$ ,  $\text{SiN}$ ), or titanium nitride ( $\text{TiN}$ ) (e.g., to a thickness of 500-1,500  $\text{\AA}$ , etc., column 5, lines 10-20, instant claim 3). These layers are followed by forming and patterning a photoresist 145 having an opening 145', as shown in Figure 2a and described at column 4, line 55 to column 5, line 24. Even though described and shown in terms of a single via opening and overlapping trench, column 1, lines 22-31 clearly state the intention of forming plural grooves or trenches and conductive holes or via openings to form plural multi-level interconnects by repeating the dual damascene process as many times as is required. This encompasses formation of plural substantially adjacent via openings (instant claims 10 and 18). A via opening 145 is etched through both dielectric layers and the intervening etch-stop layer (e.g., of ARC material, etc.) down to the substrate using the photoresist as an etching mask, then the photoresist is removed by oxygen ashing as shown in Figure 2b (column 5, lines 24-34). A main feature and key aspect of this process includes formation of an anti-reflectance coating (e.g., ARC, bottom ARC (BARC), etc.) 150 as a protective cover over the dielectric (e.g., IMD, etc.) upper surface and in the via opening 145, covering the via sidewalls and bottom to the point of filling the via opening; then forming and patterning another photoresist layer 160 with an opening or trench 165' over the via opening as shown in Figure 2c. Suitable ARC materials include titanium nitride ( $\text{TiN}$ ), silicon oxynitride ( $\text{SiON}$ ), and/or organic materials (column 5,

Art Unit: 1756

lines 35-61, instant claims 7 and 23-24). This ARC or BARC 150 can be either opaque or translucent, and yet not reflect electromagnetic radiation. These ARC properties hint at the usefulness of a second underlying ARC (instant claims 11, 13-15, and 19-20). While not specifying an alternative embodiment requiring non-filling of the ARC layer in the holes or openings, it is readily apparent that adequate protection could also be obtained by using one or more ARC layers of sufficient thickness without necessarily requiring that the ARC material fill one or more via openings or holes, provided that the openings or holes have widths of more than twice a total sufficient ARC layer thickness on the sidewalls of the openings or holes. In fact, prior art Figures 1c-1f show just such a configuration for a thin conformal etch barrier layer or an etch stop layer 50, which is coated on the sidewalls of an opening or hole without filling the opening or hole and is conventionally formed of silicon oxynitride ( $\text{SiON}$ ,  $\text{SiO}_x\text{N}_y$ ), silicon nitride ( $\text{Si}_3\text{N}_4$ ,  $\text{SiN}$ ) and/or titanium nitride ( $\text{TiN}$ ) (column 2, lines 4-64). These same materials have already been noted above for their utility as ARC layers, so these etch stop materials are also expected to inherently function as ARC layers about 500-1,500 Å thick (instant claims 1, 3, 8, and 17 for an ARC thickness of 100-1,000 Å).

While teaching at least portions of most of the limitations found in claims 1-3, 7-8, 10-11, 13-15, and 17-24 as pointed out above (even though some of these limitations were interpreted as inherent in the cited reference), Lin does not directly teach limiting the ARC layer thickness to about 100-1,000 Å on the sidewalls of the via openings or holes without filling the openings or holes and does not specify using plural overlapping ARC layers (though the usefulness of such a combination is hinted by stating that the ARC can be translucent).

Art Unit: 1756

Yu shows suitability of a TiN barrier layer (18, 46) as a thin conformal ARC layer (about 200-1,500 Å thick, shown as 18 in Figures 4-6 and as 46 in Figures 8-12) in reducing undesirable back scattering of light during patterning of an overlying photoresist for subsequent etching therethrough to form via openings for metal interconnects in semiconductor fabrication (column 4, lines 33-62 and column 5, lines 27-41).

Filipiak discloses tailoring plural ARC (e.g., silicon nitride, silicon-rich silicon nitride, silicon oxynitride, titanium nitride, etc.) layer combinations to their intended placement in a semiconductor device to avoid reflective notching when patterning an overlying photoresist layer (column 1, lines 11-20). Plural layer antireflective coatings (ARC) disclosed as suitable for semiconductor device manufacture include ARC 38 in Figure 5 which is composed of portions 380, 382, and 384 (column 3, lines 20-27) and conformal ARC 86 in Figure 10 which is composed of portions 861, 862, and 863 (column 4, lines 36-51). As shown in Figure 6 and described at column 3, lines 48-55, ARC portions 380, 382, and 384 are 50, 100 and 200 Å thick, respectively, and are typically only as thick as needed to serve their intended purpose.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the dual damascene photolithographic process for reducing light reflectance taught by Lin as discussed above with additional conformal antireflective coating (ARC) layer(s) 50-1,500 Å thick as shown by Yu and disclosed by Filipiak, which fully encompasses instant claims 8 and 17 for ARC(s) 100-1,000 Å thick. It would also have been obvious to apply at least one thin conformal ARC layer to the sidewalls of the holes or openings without filling the holes or openings before patterning an overlying photoresist layer to avoid reflective notching of the photoresist, as taught by Lin and disclosed by Filipiak. Both of these

Art Unit: 1756

are because all these references relate to the same art of semiconductor device manufacture for the purpose of reducing undesirable reflectance by using one or more ARC layer(s) to avoid reflective notching of an overlying photoresist layer during patterning.

### ***Response to Arguments***

Applicants' arguments filed 01 August 2003 as Paper No. 3 with respect to currently pending claims 1-3, 7-8, 10-11, 13-15, and 17-26 have been considered but are either moot or not deemed persuasive in view of the maintained and new ground(s) of rejection and objection necessitated by currently amended claims 1-3, 7, 10-11, 13-15, 17, and 20, and also by new claims 21-26.

In the second line on page 15 of Paper No. 3, applicants state that no new matter has been entered by this amendment. However, amended ¶ 0042 presented on page 7 of Paper No. 3 changes the photoresist thickness of "1000 to 20000 Angstroms" found in the prior version of ¶ 0042 on page 18 of the original specification to "5000 to 9000 Angstroms". This new range for photoresist thickness does not find support in the specification as originally filed and is therefore considered new matter, as pointed out above.

Applicants have also tried to distinguish their invention over the cited prior art by further limiting their claimed invention to specifically require that at least one ARC layer covers the sidewalls of at least one via opening without filling the at least one via opening. At lines 2-4 on page 16 of Paper No. 3, applicants argue that Lin's ARC layer implicitly has a thickness at least about equal to twice the thickness of the upper and lower dielectric insulating layers (16,000-30,000 Å), based on Lin's column 5, lines 35-39. This passage does not specify the thickness of

Art Unit: 1756

the ARC layer. Instead, Lin's column 5, lines 53-61 describe an embodiment having a BARC (e.g., SiON, etc.) layer 150 coated over the top of an upper layer dielectric (ULD) 130 and continuously folded into the hole 145 to substantially fill the hole, as shown in Figures 2b and 2c. Figure 2c shows BARC 150 clearly thinner than an overlying photoresist layer 160. The preferred thickness of this photoresist 160 is 1.0-1.2  $\mu\text{m}$ , which is the same as 10,000-12,000 Å (column 5, lines 60-61). Hence, the BARC 150 in this embodiment is thought to be less than 10,000 Å thick. Nevertheless, this embodiment is not relied upon for the ARC layer thickness. Rather, Lin points out that in a dual damascene process it is conventionally known to use a thin conformal etch barrier layer 50 of about 1,000 Å thick to cover the sidewalls of a hole through insulating layers, without filling the hole. Conventional etch barrier layer materials include silicon oxynitride ( $\text{SiON}$ ,  $\text{SiO}_x\text{N}_y$ ), silicon nitride ( $\text{Si}_3\text{N}_4$ ,  $\text{SiN}$ ) and/or titanium nitride ( $\text{TiN}$ ) (column 2, lines 4-64). These same materials have also been shown useful for ARC layers, as noted above. In addition, Yu and Filipiak expand this range for ARC layer thickness to 50-1,500 Å, as previously explained.

On page 20 of Paper No. 3, applicants assert as improper the rejection(s) of the instant invention based on Lin, due to common assignment. However, Lin (US Patent 6,042,999) was issued on 28 March 2000 and is therefore a qualified reference against the instant invention, which was not filed until 29 August 2001. This is because applicants' invention was filed more than a year after Lin was patented, so Lin is a reference under 102(b) not 102(e) and common assignment does not preclude the use of Lin against the instant invention.

While applicants assert on page 21 of Paper No. 3 that there is no apparent reason for combining Yu with Lin, this reason has previously been stated and is now repeated above.

Namely, that both these references address the suitability of a thin conformal ARC layer of the same or similar material in reducing undesirable back scattering of light during patterning of an overlying photoresist during semiconductor fabrication. Additionally, it is noted that the term "conformal" indicates that the protective ARC layer conforms to a shape, profile, or surface configuration similar to that of the substrate before coating. Therefore, applying a thin conformal protective ARC layer on an underlying surface would include coating of hole or opening sidewalls without filling the hole or opening, as recited in the instant currently amended claims.

Applicants further assert, on page 22, that there is no apparent reason for combining Filipiak with either Lin or Yu. However, the reason for combining Filipiak with Lin and Yu is to tailor plural ARC layers of the same or similar material as those used in Lin and/or Yu in semiconductor device fabrication to avoid reflective notching when patterning an overlying photoresist layer. Filipiak further bolsters the use of thin conformal ARC layers by stating that they are typically only as thick as needed to serve their intended purpose of avoiding reflective notching during overlying photoresist patterning. Filipiak describes one alternative single layer ARC, called "the antireflective layer", as typically having a thickness of 100-1,000 Å and often having a thickness of 200-500 Å (column 2, lines 58-60). Further, Filipiak does not teach away from all single layer ARCs, but only those relatively uniform compositions of the prior art, which could have adherence, current leakage, or reactivity problems (column 2, lines 23-26, emphasis added). None of these problems speak to reasons for never using a single layer ARC, but only suggest ways in which the material composition of a layer of ARC must be made compatible with the intended function for which it is employed. Compatibility of a single ARC

---

Art Unit: 1756

layer can be enhanced by using a continuously graded material composition as an alternative to using plural separate ARC layers of different material, such as described at column 3, lines 12-30. As stated above, Filipiak also addresses the utility of plural compatible ARC layers, which are tailored to maintain compatibility with a particular utility while still serving to avoid reflective notching when patterning an overlying photoresist layer.

On page 23, applicants allege that the combination of Lin, Yu, and Filipiak does not produce applicants' disclosed and claimed invention. First, the above rejections of claims are only intended to address those portions of the original disclosure, which is presently claimed. Second, the resulting effect of combining these references shows a dual damascene photolithographic process for reducing light reflectance taught by Lin as discussed above, using at least one additional thin conformal ARC layer 50-1,000 Å thick as shown by Yu and disclosed by Filipiak. All three references address methods of reducing undesirable reflectance by using one or more ARC layers to avoid reflective notching of an overlying photoresist layer during photolithographic patterning to fabricate a semiconductor device. The combined process includes applying at least one thin conformal ARC layer to the sidewalls of holes or openings without filling the holes or openings before patterning an overlying photoresist layer to avoid reflective notching of the photoresist. So, this combination of teachings provides a solution to the same problem of the instant claims, and in a similar manner.

The other reasons are explained above for finding the currently amended and new claims treated on the merits to be obvious over the cited prior art of record. Therefore, the claimed invention is still found to be an obvious variation over the prior art.

**Conclusion**

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 703-305-7035. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

  
MARK F. HUFF  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700

  
John Ruggles  
Examiner  
Art Unit 1756